

What is claimed is:

1. An electrical power generator comprising:

a) a water vapor generator;

5 b) a hydrogen gas generator attached to the water vapor generator, said hydrogen generator containing a substantially non-fluid substance which reacts with water vapor to generate hydrogen gas; said hydrogen generator optionally being attached to said water vapor generator via at least one conduit; and

c) a fuel cell attached to the hydrogen gas generator; said fuel cell optionally being attached to said hydrogen gas generator via at least one conduit.

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2. The power generator of claim 1 further comprising at least one conduit connecting the water vapor generator to the hydrogen gas generator and at least one conduit connecting the hydrogen gas generator to the fuel cell.

15 3. The power generator of claim 1 further comprising a return line which directs residual water vapor and hydrogen gas from the fuel cell to the water vapor generator.

20 4. The power generator of claim 1 wherein the water vapor generator comprises a chamber at least partially filled with water vapor.

5. The power generator of claim 1 wherein the water vapor generator is at least partially filled with ice.

25 6. The power generator of claim 1 wherein the hydrogen gas generator comprises a chamber at least partially filled with a substantially non-fluid substance which reacts with water vapor to generate hydrogen gas.

7. The power generator of claim 1 further comprising an inert gas within said water vapor generator, hydrogen generator and fuel cell.

5 8. The power generator of claim 7 wherein the inert gas comprises a gas selected from the group consisting of nitrogen, argon and combinations thereof.

9. The power generator of claim 1 further comprising hydrogen gas initially loaded within at least one of said water vapor generator, hydrogen gas generator,
10 fuel cell and said optional conduits.

10. The power generator of claim 1 further comprising at least one device attached to at least one of said water vapor generator, said hydrogen generator or said fuel cell for causing an initial flow of water vapor from the water vapor
15 generator to the hydrogen gas generator.

11. The power generator of claim 1 wherein said substantially non-fluid substance comprises a material selected from the group consisting of alkali metals, calcium hydride, lithium hydride, lithium aluminum hydride, sodium
20 borohydride and combinations thereof.

12. The power generator of claim 1 wherein said substantially non-fluid substance comprises sodium borohydride.

25 13. The power generator of claim 1 further comprising a hydrogen generation catalyst combined with said substantially non-fluid substance.

14. The power generator of claim 13 wherein said catalyst is selected from the group consisting of cobalt, nickel, ruthenium and alloys and combinations thereof.

5 15. The power generator of claim 1 further comprising at least one pump for pumping hydrogen gas and water vapor between the water vapor generator and the fuel cell.

10 16. The power generator of claim 1 further comprising at least one valve for regulating the passage of hydrogen gas and water vapor between the water vapor generator and the fuel cell.

15 17. The power generator of claim 1 further comprising porous plugs adjacent to said water vapor generator, said plugs substantially impeding the flow of liquid water from said water vapor generator and substantially allowing the flow of hydrogen gas and water vapor into and out of said water vapor generator.

18. The power generator of claim 1 wherein said substantially non-fluid substance is in powder, granule or pellet form.

20 19. The power generator of claim 1 wherein said fuel cell is at least partially surrounded by a thermal insulator.

25 20. The power generator of claim 1 further comprising a heater adjacent to the fuel cell.

21. The power generator of claim 1 further comprising a tensile membrane within the water vapor generator which exerts pressure directing water vapor from the water vapor generator to the hydrogen gas generator.

- 5 22. A process for generating hydrogen gas for fueling a fuel cell comprising:
- a) directing water vapor from a water vapor generator to a hydrogen generator, said hydrogen generator being at least partially filled with a substantially non-fluid substance which reacts with water vapor to generate hydrogen gas; and
 - b) directing hydrogen gas and any residual water vapor from the hydrogen
- 10 generator to a fuel cell.

23. The process of claim 22 further comprising:

- c) directing any residual water vapor and any residual hydrogen gas from the fuel cell back to the water vapor generator.

15 24. The process of claim 22 further comprising directing water vapor and any present hydrogen gas from the water vapor generator to the hydrogen generator via at least one conduit, and directing hydrogen gas and any residual water vapor from the hydrogen gas generator to the fuel cell via at least one conduit.

- 20 25. The process of claim 22 further comprising directing water vapor and any present hydrogen gas from the water vapor generator to the hydrogen generator via at least one conduit, and directing hydrogen gas and any residual water vapor from the hydrogen gas generator to the fuel cell via at least one conduit; and
- 25 directing any residual water vapor and any residual hydrogen gas from the fuel cell to the water vapor generator via at least one return line.

26. The process of claim 22 wherein the water vapor generator comprises a chamber at least partially filled with water vapor.

27. The process of claim 22 wherein the passage of said water vapor and said
5 hydrogen gas from the water vapor generator to the fuel cell is controlled by at least one valve.

28. The process of claim 22 wherein said substantially non-fluid substance
comprises a material selected from the group consisting of alkali metals, calcium
10 hydride, lithium hydride, lithium aluminum hydride, sodium borohydride and combinations thereof.

29. The process of claim 22 wherein said substantially non-fluid substance
comprises sodium borohydride.
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30. The process of claim 22 wherein said substantially non-fluid substance is in powder, pellet or granule form.

31. The process of claim 22 further comprising pumping said water vapor and
20 any present hydrogen from said water vapor generator to said hydrogen gas generator.

32. The process of claim 22 further comprising heating said fuel cell with a heater.

25 33. The process of claim 22 comprising directing water vapor from the water vapor generator to the hydrogen gas generator by pressure from a tensile membrane within the water vapor generator.

34. The process of claim 22 further comprising causing an initial flow of water vapor from the water vapor generator to the hydrogen gas generator via at least one device attached to at least one of said water vapor generator, said hydrogen
5 generator or said fuel cell.

35. In an improved process for generating electrical energy wherein water and hydrogen gas are directed from a water containing chamber to a fuel cell; and water and any residual hydrogen gas are directed from the fuel cell back to the
10 water containing chamber; and water and hydrogen gas are directed through a hydrogen gas generator, which hydrogen gas generator is connected to each of the fuel cell and water containing chamber and which hydrogen gas generator is at least partially filled with a substance which reacts with water to generate hydrogen
15 gas, wherein the improvement comprises contacting water in the form of water vapor with a substantially non-fluid substance which reacts with water vapor to generate hydrogen gas.